REMARKS

This Amendment is responsive to the Office Action mailed September 3, 2003. In the Office Action, the Examiner objected to the drawings as failing to comply with 37 C.F.R. 1.84(p)(4) and (5). The disclosure was objected to because of informalities discussed further below. Further, the Examiner rejected claims 1-3, 6-13, 16, 17, 32, and 45 under 35 U.S.C. §103(a) as being unpatentable over Olmstead, U.S. Patent No. 3,931,736 ("Olmstead") in view of Mickler, U.S. Patent No. 4,876,887 ("Mickler"). Claims 4, 5, 31, and 46 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Olmstead '736 Patent in view of Mickler, and further in view of Elmore, U.S. Patent No. 6,234,241 ("Elmore"). Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over the Olmstead '736 Patent in view of Mickler, and further in view of Olmstead, U.S. Patent No. 3,942,378 ("Olmstead '378"). Claim 15 was rejected under 35 U.S.C. §103(a) as being unpatentable over the Olmstead '736 Patent in view of Mickler, and further in view of Inushima et al., U.S. Patent No. 6,550,325 ("Inushima"). Claims 18-29 and 33-44 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Olmstead '736 Patent in view of Mickler, and further in view of Bonne et al., U.S. Patent No. 6,019,505 ("Bonne").

With this Amendment, claims 1-46 remain pending in the application and are presented for reconsideration and allowance.

Examiner's Objection to the Drawings under 37 C.F.R. 1.84(p)(4)

The Examiner objected to the drawings as failing to comply with 37 C.F.R. 1.84(p)(4) because reference characters "52" and "100" had both been used to designate "a flexible substrate." With the amendment to the Specification, reference number "52" now only designates a circuit assembly 52, and reference number "100" only designates a flexible substrate 100.

The Examiner objected to the drawings as failing to comply with 37 C.F.R. 1.84(p)(5) because they included the reference number "44" not otherwise mentioned in the description. With the amendment to the drawings, reference number "44" in Fig. 3 has been changed to reference number "40". Therefore, in light of these amendments, it is respectfully submitted that

the Examiner's objections on the above-referenced grounds have been traversed. For that reason, it is respectfully requested that Examiner's objection to the drawings be withdrawn.

Examiner's Objection to the Specification

The Examiner objected to the Specification based upon the informalities that on page 12, lines 2 and 4, reference number "150" should be "50" and on page 17, line 25, reference number "52" should be "32". With the amendment to the Specification, the above-referenced informalities have been corrected. Therefore, it is respectfully submitted that the Examiner's objection on those grounds have been traversed.

Claim Rejections under 35 U.S.C. §103(a)

The Examiner rejected claims 1-3, 6-13, 16, 17, 32, and 45 under 35 U.S.C. § 103(a) as being unpatentable over Olmstead in view of Mickler.

Claim 1 relates, in part, to an airflow sensor comprising a housing defining an internal compartment and a top face; and a flexible substrate disposed within the compartment, such that a back of the substrate is exposed relative to an opening in the top face. As an initial matter, it is respectfully noted that the Examiner fails to cite the prior art for any deficiency or improvement addressed by incorporating flexibility into the primary reference of Olmstead to supply motivation for the asserted combination. Olmstead already provides a substrate 46 within a fluid flowmeter as stated by the Examiner, and does not provide a requisite suggestion to use a flexible substrate. In fact, Olmstead teaches away from a flexible substrate. In particular, substituting a flexible substrate would destroy the functionality of Olmstead. Although Olmstead teaches a thin membrane 36, which might imply flexibility of the membrane by itself, the membrane 36 is bonded to an *inflexible* substrate 46 made of printed circuit board material or alumina. (Olmstead column 2, lines 1-15 and lines 31-36). Such rigidity is necessary as Olmstead also teaches assembly of the sensor into a body 10 via bolts or similar means extending through the substrate 46. (Olmstead FIG. 1 and column 3, lines 9-23). It is inherent that a *rigid* substrate, rather than a flexible one, would be amenable to assembly of a sensor via bolts extending through openings in a substrate, i.e. to avoid tearing or other catastrophic failure. Not

only does Olmstead teach that rigidity in the substrate is preferential, it is inherently a pre-requisite.

Claim 1 also relates, in part, to an airflow sensor configured to eliminate accumulation of debris along the back of the flexible substrate. Olmstead merely teaches an assembly wherein the electrical elements of the fluid flow sensor 30 are protected from direct contact with a fluid, which might otherwise cause corrosion, contamination or explosion *of the electrical components.* This does not teach or suggest preventing contamination of, or the accumulation of debris on, the thin membrane 36 serving to protect the electrical elements 40, 42. In fact, the presence of the gasket 28 between the body 10 and sensor 30 would appear to provide a surface for the accumulation of debris and other particulate on the thin membrane 36. In addition, Mickler provides no motivation for modification, as Mickler teaches direct exposure of the sensor 11, including the sinuous coil pattern 19, to fluid flow. (FIG. 2, Mickler). This configuration would defeat Olmstead's goal of limiting sensor contamination and the exposed coil 19 would also provide a purchase for debris. Thus, neither Olmstead nor Mickler teach configuring the airflow sensor to limit accumulation of debris along the back of the flexible substrate as required by the limitations of claim 1.

Claim 1 also relates, in part, to an airflow sensor comprising a housing defining an internal compartment and a top face; a flexible substrate disposed within the compartment such that a back of the substrate is exposed relative to an opening in the top face; and electrical components extending from a front of the substrate opposite the opening in the top face of the compartment. It is unclear as to what portion of the housing 10 of Olmstead the Examiner has identified as being the "top face" and "opening" of claim 1. Assuming the Examiner has relied upon the orientation of FIG. 1 of Olmstead for directional relationships, in exploded form, the housing 10 has a "top" opening that is opposite two channel openings 24, 26. If this "top" opening is deemed to be the top face and opening of claim 1, then Olmsted does not teach that a back face of the flexible substrate is exposed relative to this opening. As a starting point, the substrate 46 is encompassed on one side or face by the membrane 36 and the gasket 28, and on the other side or face by the cover 64. Thus, regardless of what is designated as the "opening" of the housing 10, neither face of the substrate 46 is exposed. Further, if the separate membrane 36

is somehow viewed as being the substrate of claim 1 (in which case, the requirement of the "substrate having circuitry traces" is not satisfied), the face of this membrane 36 opposite the substrate 46 is not exposed relative to the "top opening" of the housing 10; instead, it is opposite this top opening. Conversely, if the channels 12, 20 are somehow viewed as being the "opening" of claim 1, then Olmstead does not teach at least the electrical components extending opposite the opening. Mickler also does not satisfy these limitations.

For at least the above reasons, it is respectfully submitted that claim 1 is not taught or suggested by the cited references.

In addition to the arguments presented above in regard to claim 1, the claims depending from claim 1 may be differentiated from the cited references for alternative reasons. For example, claim 2 relates to the airflow sensor of claim 1, wherein the top face forms a lip otherwise defining an opening, the opening including an outer dimension less than that of the substrate, such that upon final assembly, the back of the substrate abuts the lip. In the sensor assembly taught in FIG. 1 of Olmstead, the gasket 28 is provided on one side of the substrate 46/membrane 36 and the cover 64 is provided on the other side. Therefore, regardless of what the Examiner is referring to as the top face, opening and lip of Olmstead, the back of the substrate 46 of Olmstead cannot abut a housing lip due to the gasket 28 and the cover 64.

As another example, claim 9 relates to the airflow sensor of claim 1 including a first circuitry trace extending in a serpentine fashion between a first and a second temperature sensor. Mickler teaches a sinuous coil pattern 19, however, one of ordinary skill in the art would not be motivated to connect two temperature sensors together with the Mickler coil 19. The coil 19 acts as a heat source and would therefore interfere with the proper operation of heat sensors connected to the heat coil. (Mickler column 2, lines 35-42). Therefore, there would be no motivation to combine the heating coil of Mickler with temperature sensors of Olmstead.

Further, claim 16 relates to the airflow sensor of claim 1 further comprising insulating material disposed within the compartment *below* the flexible substrate. With reference to FIG. 2 of Olmstead, it is apparent that the insulating epoxy resin 48 is located *within* the substrate 46.

For at least the reasons outlined above, it is believed that claim 1 presents patentable matter over the cited references. As claims 2-16 depend from claim 1, claims 2-16 also present

patentable matter over the cited references and are distinguishable for that reason and at least the additional reasons cited.

Claim 17 relates, in part, to a processor being adapted to determine an airflow state within an air handling system based upon a difference between determined current temperatures of two sensors, DT, and a rate of change in DT. As a preliminary matter, Examiner fails to cite the prior art for any deficiency or improvement addressed by incorporating a processor adapted to determine airflow based upon a difference between determined current temperatures, DT, and a rate of change in DT into the primary reference. It is noted that the Examiner acquiesces that Olmstead fails to teach or suggest such limitations at page 6, lines 7-12 of the Office Action. Further, Mickler also fails to teach determination of a rate of change in DT. Mickler merely teaches acquisition of an instantaneous value of DT or the temperature of a heated active sensor 35 minus the temperature of a heated reference sensor 37. (Mickler column 5, lines 5-8). In no manner does Mickler teach the acquisition of a rate of change in DT, i.e., DT as a function of time, much less the determination of an airflow state by the comparison of such a value to the determined current temperature difference DT. Thus, Mickler fails to teach or suggest the comparison of DT to a rate of change in DT to determine an airflow state within the air handling system.

In addition to the arguments presented above with regard to claim 17, claims 18-31, depending from claim 17, may be differentiated from the cited references for alternative reasons. For example, claim 30 incorporates some structural limitations comparable to those of claim 1. In particular, claim 30 relates, in part, to a sensor including a housing defining an internal compartment and a top face, the top face forming an opining and a flexible substrate being disposed within the compartment such that a back of the substrate is exposed relative to the opening in the top face. Thus, claim 30 may be further distinguished from the cited references for reasons similar to those stated with regard to claim 1.

Claim 32 is not taught or suggested by the cited references for similar reasons as those stated with regard to claim 17. Thus, claims 33-46, which depend from claim 32, are patentable over the cited references. However, these claims may be distinguished on additional grounds.

For example, claim 45 includes structural element requirements similar to those of claims 1 and 30, which as previously described are patentable over the cited references.

The Examiner rejected claims 18-29 and 33-44 under 35 U.S.C. § 103(a) as being unpatentable over Olmstead in view of Mickler, and further in view of Bonne.

As stated above, these claims either depend from claim 17 or claim 32, which as previously described are patentable over the cited references. These claims may be further distinguished from the prior art with regard to the Bonne reference. Claims 18 and 33 relate to a temperature rate of change value based upon a difference DT and a lag temperature differential value, and comparison of the temperature rate of change value with at least one threshold value to detect the presence of airflow. As a preliminary matter, Examiner fails to cite the prior art for any deficiency or improvement addressed by incorporating a processor adapted to determine airflow based upon a difference between determined current temperatures, DT, and a rate of change in DT, much less one relating to lag temperature values, to detect the presence of airflow into the primary reference.

The Examiner concedes that Olmstead and Mickler fail to teach or suggest a processor adapted to process measurements, including lag temperature differential values. Further, Bonne also fails to teach or suggest the acquisition of current temperature readings at two distinct temperature sensors and comparing the difference between those two temperature sensors readings, or DT, to a lag temperature differential value in order to generate a temperature rate of change value. Bonne merely teaches a heater element 224 and a spaced sensor element 226 both in a fluid medium at substantially zero flow. While, "transit time" is measured, for a single sensor, in no manner does Bonne teach or suggest measuring a rate of change in the temperature difference *between two sensors*. (Bonne column 7, lines 34-44). Although Bonne teaches that "it is recognized that any number of heater and sensor elements may be provided in a like matter," it is also readily recognizable that these additional heater and sensor elements would operate under the same principle, i.e., providing a signal to a heater and measuring the transient time for the temperature disturbance to travel from the heater element 224 to the sensor element 226. (Bonne column 8, lines 10-24).

Claims 18 and 33 also relate, in part, to detection of the presence of airflow. The Examiner argues Bonne teaches that the determination of thermal diffusivity is for when airflow is not present and the determination of thermal conductivity is for when airflow is present. However, Bonne expressly teaches away from air flow detection by requiring that thermal conductivity, thermal diffusivity, and specific heat of a fluid of interest be determined at *substantially zero flow*. (Bonne column 15, lines 49-52 and column 7, lines 34-39 and 17-19). The zero flow condition is required to allow simplification and solution of a three-dimensional temperature diffusivity or heat conductivity equation. (Bonne column 15, lines 24-52). Thus, it is not understood how Bonne may teach or suggest the detection of the presence of airflow, when the Bonne invention is to be employed solely at substantially zero flow conditions.

For at least these additional reasons, it is respectfully submitted that claims 18-29 present patentably distinct matter over the cited references.

Claims 4, 5, 31, and 46 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Olmstead in view of Mickler and further in view of Elmore.

As noted above, these claims depend from independent claims, which are neither taught nor suggested by the cited references. However, in terms of the Examiner's reference of Elmore, the Examiner fails to cite the prior art for any deficiency or improvement addressed by incorporating a flow sensor. The Examiner states that the combination would be for the purpose of preventing growth of microorganisms, etc. Elmore already accomplishes this purpose. It is unclear why one of ordinary skill in the art would be motivated to combine an air flow sensor and an ultraviolet air treatment device absent the reasons provided in the Applicant's Specification. Additionally, these claims may be further distinguished from the prior art with regard to the Elmore reference. Elmore specifically teaches that the bulb turns on either when the fan motor is energized, via parallel wiring, or continuously. (Elmore, Column 2, lines 55-64). Further, the Examiner has cited no reference that teaches or suggests the limitations of claim 5. For at least these additional reasons, it is respectfully submitted that claims 4, 5, 31, and 46 present patentably distinct material over the cited references.

CONCLUSION

In light of the above, Applicant believes independent claims 1, 17, and 32 and the claims depending therefrom, are in condition for allowance. Notice to that effect is respectfully requested.

No fees are required under 37 C.F.R. 1.16(b)(c). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 500471.

The Examiner is invited to contact the Applicant's Representative at the below-listed telephone number if there are any questions regarding this Response.

Respectfully submitted,

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CERTIFICATE UNDER 37 C.F.R. 1.8:

The undersigned hereby certifies that this paper or papers, as described herein, are being deposited in the United States Postal Service, as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 3rd day of **December, 2003**.

By_____
Name: **Timothy A. Czaja**